REMARKS

Upon entry of this amendment, claims 1-3, 5-14 and 16-21 are all the claims pending in the application. Claims 4 and 15 have been canceled by this amendment.

I. Claim Rejections under 35 U.S.C. § 102

A. Claims 1-6 and 14-16 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Stava (US 6,501,049).

By this amendment, Applicants note that claim 4 has been canceled, and that all of the features recited in claim 4 have been incorporated into claim 1. Thus, claim 1 now recites that a length of time elapsed from occurrence of the short circuit is obtained, and the gradient of the current waveform in a short-circuit condition is controlled according to the length of time elapsed from occurrence of the short circuit.

Applicants respectfully submit that Stava does not disclose or suggest the above-noted features recited in amended claim 1.

Regarding Stava, Applicants note that this reference discloses a short circuit welding process including a short condition 10, an arc condition 12, tailout 14, and background 16 (see Fig. 1 and col. 4, lines 25-27). In this regard, as described in Stava with reference to Fig. 1, at time 30, metal is transferred from an electrode to a workpiece by surface tension action, with this action being accelerated by pinch pulse 32 that is used to control the current with a profile having a rapidly increasing current section 32a, a breakpoint 32b to give a second slope, and a premonition point 32c (see col. 4, lines 35-41).

With respect to the above-noted feature recited in claim 1 which indicates that the gradient is controlled according to the length of time elapsed from occurrence of the short circuit,

Applicants note that in the Office Action, the Examiner has indicated that in Stava, the "gradient is controlled based on the time elapsed since the gradient will increase more as the elapsed time increases since the current is being increased during this time" (see Office Action at page 3).

Based on the Examiner's above-noted comments, Applicants believe that the Examiner is taking the position that the gradient of the current waveform in Fig. 1 of Stava increases between points 32b and 32c (and in Fig. 3, between points 110a and 110b). Applicants respectfully point out that such a position is incorrect.

In particular, Applicants note that the "gradient" of a slope is the degree of inclination of the slope. Thus, in Fig. 1 of Stava, while the current increases from point 32b to point 32c, Applicants note that the gradient between points 32b and 32c is constant. In other words, from point 32b to point 32c in Fig. 1 of Stava, the degree of inclination (i.e., the gradient) of the slope is constant. Further, Applicants note that Stava does not include any disclosure indicating that the gradient of the current waveform can be controlled during the short-circuit condition according to the length of time elapsed from occurrence of the short circuit.

In view of the foregoing, Applicants respectfully submit that Stava does not disclose, suggest or otherwise render obvious the above-noted feature recited in amended claim 1 which indicates that the gradient of the current waveform in a short-circuit condition is controlled according to the length of time elapsed from occurrence of the short circuit.

Regarding the above-noted feature recited in claim 1, Applicants note that as described in an illustrative, non-limiting embodiment of the present invention, by providing the ability to control the gradient of the current waveform in a short-circuit condition, it is possible to shorten the short-circuit period, which minimizes a delay in pulse-starting time of a pulse interval, and

thus improves arc stability (see the specification at page 15, lines 10-27; and Fig. 4 of the application).

In view of the foregoing, Applicants submit that claim 1 is patentable over Stava, an indication of which is kindly requested. Claims 2, 3, 5, 6 and 14-16 depend from claim 1 and are therefore considered patentable at least by virtue of their dependency.

In addition, regarding claim 5, Applicants note that this claim recites that the longer the time elapsed from occurrence of the short circuit, the greater the gradient of the current waveform applied in the short-circuit condition. Applicants respectfully submit that Stava does not disclose or suggest such a feature.

In particular, as described above, the gradient of the current waveform in Stava from point 32b to point 32c in Fig. 1 is constant. As such, Applicants respectfully submit that Stava clearly does not disclose, suggest or otherwise render obvious the above-noted feature recited in claim 5 which indicates that the longer the time elapsed from occurrence of the short circuit, the greater the gradient of the current waveform applied in the short-circuit condition.

Accordingly, Applicants submit that claim 5 is patentable over Stava, an indication of which is kindly requested.

B. Claims 7-13 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Kawai (JP 01-266966).

Regarding claim 7, Applicants note that this claim recites the feature of a secondary control section for sharply decreasing welding current on detecting a moment at which a tip of a wire has a neck just before recovery from a short-circuit. Applicants respectfully submit that Kawai does not disclose or suggest at least this feature of claim 7.

In particular, as is evident from Figs. 2 and 5 of Kawai, Applicants note that the current waveform during a time in which a short circuit is occurring is similar to the current waveform shown in Fig. 4 of the present application, which depicts the current waveform of a conventional arc welding device.

In contrast to the conventional current waveform shown in Fig. 4 of the present application, and in Figs. 2 and 5 of Kawai, which do not depict a current waveform in which the welding current sharply decreases on detecting a moment at which a tip of a wire has a neck just before recovery from the short-circuit, Applicants note that Fig. 2 of the present application depicts an illustrative example of a current waveform during a time in which a short circuit is occurring, in which the welding current sharply decreases on detecting a moment at which a tip of a wire has a neck just before recovery from the short-circuit.

In view of the foregoing, Applicants respectfully submit that Kawai does not disclose, suggest or otherwise render obvious the above-noted feature recited in claim 7 of a secondary control section for sharply decreasing welding current on detecting a moment at which a tip of a wire has a neck just before recovery from a short-circuit.

Accordingly, Applicants submit that claim 7 is patentable over Kawai, an indication of which is kindly requested. Claims 8-13 depend from claim 7 and are therefore considered patentable at least by virtue of their dependency.

In addition, regarding claims 10 and 11, Applicants note that claim 10 recites that the setting section measures a length of time elapsed from occurrence of a short circuit according to the signal from the arc short-circuit judging section, and controls a gradient of a current waveform in a short-circuit condition according to the length of time elapsed from occurrence of the short-circuit, and that claim 11 recites that the setting section performs output control so as to

increase a steepness of the gradient of the current waveform in the short-circuit condition as the length of time elapsed from occurrence of the short-circuit increases.

With respect to the above-noted features recited in claims 10 and 11, Applicants note that the Examiner has taken the position in the Office Action that Fig. 5 of Kawai depicts such features (see Office Action at page 4). Applicants respectfully disagree.

In particular, in Kawai, Applicants note that while the current increases during the short-circuit condition, that the gradient of the current waveform in the short-circuit condition is constant (see Figs. 2 and 5). Accordingly, as Kawai merely discloses a constant gradient, and does not include any disclosure regarding the ability to control the gradient of the current waveform in a short-circuit condition, Applicants respectfully submit that Kawai does not disclose, suggest or otherwise render obvious the above-noted features of claims 10 and 11 which indicate that the setting section controls a gradient of a current waveform in a short-circuit condition according to the length of time elapsed from occurrence of the short-circuit (claim 10), and that the setting section performs output control so as to increase a steepness of the gradient of the current waveform in the short-circuit condition as the length of time elapsed from occurrence of the short-circuit increases (claim 11).

Accordingly, Applicants submit that claims 10 and 11 are patentable over the cited prior art, an indication of which is kindly requested.

II. Claim Rejections under 35 U.S.C. § 103(a)

Claims 17-21 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Kawai (JP 01-266966) in view of Stava (US 5,001,326).

Claims 17-21 depend from claim 7. Applicants submit that Stava fails to cure the deficiencies of Kawai, as discussed above, with respect to claim 7. Accordingly, Applicants submit that claims 17-21 are patentable at least by virtue of their dependency.

In addition, regarding claims 18 and 19, Applicants note that claim 18 recites that the setting section measures a length of time elapsed from occurrence of a short circuit according to the signal from the arc short-circuit judging section, and controls a gradient of a current waveform in a short-circuit condition according to the length of time elapsed from occurrence of the short-circuit, and that claim 19 recites that the setting section performs output control so as to increase a steepness of the gradient of the current waveform in the short-circuit condition as the length of time elapsed from occurrence of the short-circuit increases.

With respect to the above-noted features recited in claims 18 and 19, Applicants note that the Examiner has taken the position in the Office Action that Stava discloses such features (see Office Action at page 6). Applicants respectfully disagree.

In particular, as shown in Fig. 4 of Stava, Applicants note that the gradient of the current waveform is constant. Accordingly, as Stava merely discloses a constant gradient, and does not include any disclosure regarding the ability to control the gradient of the current waveform in a short-circuit condition, Applicants respectfully submit that Stava does not disclose, suggest or otherwise render obvious the above-noted features of claims 18 and 19 which indicate that the setting section controls a gradient of a current waveform in a short-circuit condition according to the length of time elapsed from occurrence of the short-circuit (claim 18), and that the setting section performs output control so as to increase a steepness of the gradient of the current waveform in the short-circuit condition as the length of time elapsed from occurrence of the short-circuit increases (claim 19).

Accordingly, Applicants submit that claims 18 and 19 are patentable over the cited prior art, an indication of which is kindly requested.

III. Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may best be resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

Respectfully submitted,

Atsuhiro KAWAMOTO et al.

/Kenneth W. Fields/
2009.09.02 23:15:01 -04'00'

By _____
Kenneth W. Fields
Registration No. 52,430
Attorney for Applicants

KWF/krg
Washington, D.C. 20005-1503
Telephone (202) 721-8200
Facsimile (202) 721-8250
September 2, 2009